A DEVONIAN ECHINOID FROM TAEMAS, SOUTH OF YASS, N.S.W.

Ida A. Brown (Mrs. W. R. Browne)

(Plate IV)

[Read 28th June, 1967]

Synopsis

The paper describes a Lepidocentrid echinoid as a new genus and new species (*Cavanechinus warreni*) from the Middle Devonian Cavan Bluff Limestone near Taemas Bridge over the Murrumbidgee River, south of Yass, New South Wales. This is the first record of a Devonian echinoid from Australia.

Introduction

Echinoids are very rare Palaeozoic fossils in any part of the world. None is known from the Cambrian ; three genera have been reported from the Upper Ordovician of Scotland, and about five genera are known from the Silurian of the British Isles, Gotland and North America. Six genera have been described from the Devonian ; two of these are from the Lower Devonian of Germany, the others are from the Middle and Upper Devonian of North America and Europe.

There is a marked increase in the number and variety of forms in the Carboniferous and Permian of North America and Europe, with the remains of Cidaroida gradually replacing the earlier fossil Echinoidea.

In a paper on evolutionary trends shown by Palaeozoic echinoids Kier (1965) gives an analysis of the numbers of specimens, species and genera known up to date, proving the rarity of this group in the fossil record.

In Australia there are still scanty records of any Echinodermata from the Palaeozoic ; representatives of most of the major groups have been found, but, except for crinoids, few individuals have been collected. Recent Australian discoveries include carpoid echinoderms from the Silurian and Devonian of Victoria (Gill and Caster, 1960), a Silurian edrioasteroid from Victoria (Philip, 1963), a Silurian cystoid from New South Wales (Brown, 1963), an Ordovician cystoid from Western Australia (Brown, 1964) and a Carboniferous echinoid from Western Australia (Thomas, 1965).

Palaeozoic echinoids are particularly rare. Etheridge (1892) described a specimen of a cidaroid (*Archaeocidaris selwyni*) from the Upper Marine (Permian) at Nowra, N.S.W., which had been rescued from the debris of the Garden Palace fire in Sydney in 1882, also an indeterminate species of about the same age from near Maitland, N.S.W.

Mitchell (1897) described a specimen from the Silurian shales at Bowning, N.S.W., as *Palaechinus* sp. The specimen is an external mould of about a dozen plates of an echinoderm, either an echinoid or a cystoid (Brown, 1963) ; the hexagonal plates are arranged in four rows, each plate showing fine tubercles in rows parallel to the sutures. No ambulacra are visible, but the specimen might possibly be part of the interambulacrum of an echinoid similar to the Silurian palaechinoid *Gotlandechinus* described by Regnéll (1957).

Apart from the recent paper by Thomas (1965) describing a specimen of *Oligoporus* (?) sp. from Western Australia, other records of Australian Palaeozoic echinoids are confined to notes on spines and fragments (Chapman, 1907 ; Jones, 1958, *etc.*).

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The echinoid specimen now under consideration was collected by Dr. J. Warren of Monash University, Victoria, and was sent to me by Dr. J. A. Talent of the Geological Survey of Victoria. I am grateful to both of them for permission to describe and record it. It comes from the Devonian Cavan Bluff Limestone near the northern end of Taemas Bridge over the Murrumbidgee River at the head of Burrenjuck Reservoir, about 13 miles south of Yass, N.S.W.

An account of the stratigraphy and a map of the area have already been published (Browne, 1954, 1959) and the detailed palaeontology is still under consideration. On account of the rarity of Palaeozoic echinoderms in this country this form is being described separately.

The specimen is a block of limestone exposing fragments of several individuals of a Lepidocentrid echinoid associated with brachiopods (*Spirifer* spp. and *Atrypa* sp.), crinoid ossicles and other shell fragments. All the echinoid plates are of calcite ; they are firmly cemented to the limestone matrix and could not be extracted from the rock. The limestone is black when fresh and weathers to a yellowish residue.

Comparison of the Taemas specimen with the published records of Palaeozoic echinoids indicates that it most closely resembles Devonian species of *Lepidechinoides* Olsson and *Leptocentrus* Müller from North America and Germany respectively.

In view of the geographical distances between these occurrences and the fact that some of the distinguishing characters of the genera from the northern hemisphere are not seen in the specimen under consideration it is proposed that a new genus be erected for the species from the Cavan Bluff Limestone.

It is of some interest to note that, although so few specimens of Australian Palaeozoic Echinoidea have been recognised up to the present, three Orders of the Sub-class Perischoechinoidea are represented by unique specimens ; the Palaechinoida Haeckel, 1866, by *Oligoporus* (?) sp. (Thomas, 1965) ; the Cidaroida Claus, 1880, by *Archaeocidaris* sp. (Etheridge, 1892) ; and the Echinocystitoida Jackson, 1912, by the present species. There can be little doubt that many more specimens will be obtained in future collections here.

The classification of the Echinoidea has been discussed by Jackson (1912), Mortensen (1935), Durham and Melville (1957), Philip (1965), Kier (1965) and others. In the present paper the classification used in the " Treatise on Invertebrate Paleontology, Part U, Echinodermata 3(1) " (Moore, 1966) has been adopted.

Systematic Description

Class Echinoidea Leske, 1778
Sub-class Perischoechinoidea McCoy, 1849
Order Echinocystitoida Jackson, 1912
Family Lepidocentridae Lovén, 1874
Genus Cavanechinus, new genus

Diagnosis—Lepidocentroid test, possibly spherical. Ambulacra narrow, composed of two columns of primary plates imbricating adorally and under the adradial columns. The height of four or five ambulacral plates equals the height of one adradial plate. Pore-pairs uniserial and situated midway between the perradial and adradial sutures ; pores completely enclosed by the ambulacral plates.

The interambulacra are at least four times the width of the ambulacra at the ambitus, with about nine (9) columns of plates strongly imbricating adapically and from the centre outwards over the ambulacra. Plates fan-shaped or polygonal, each with a small central tubercle. Small hollow spines associated. Apical, adoral and internal characters unknown.

Type Species—Cavanechinus warreni, gen.n. *et* sp. n.

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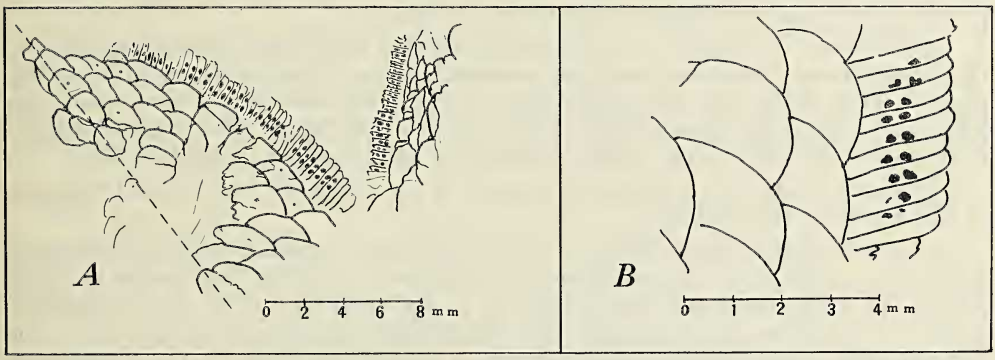
Type Species—Cavanechinus warreni, gen.n. *et* sp. n.

Comparison with other genera—Cavanechinus is a typical member of the family Lepidocentridae, most closely resembling Devonian members.

Palaeodiscus Salter, 1857, from the Silurian of England is still imperfectly known as the specimens are poorly preserved. The pore-pairs in the peristomal region are closer to the perradial suture than in *Cavanechinus*, and according to Gregory (1897) there are no pores through the plates of the aboral surface. The lantern of *Palaeodiscus* has been studied by MacBride and Spencer (1938).

" *Koninckocidaris* " *silurica* Jackson from the Silurian Niagara Limestone, the oldest known echinoid in America, is probably not congeneric with the type species from the Mississippian (Kier, 1965, p. 450), but Jackson's (1912) figs. 5–6, Pl. 20, show a general resemblance to *Cavanechinus*. There are seven or eight columns of plates in the interambulacral areas and three ambulacral plates are equal in height to one adradial plate. As in *Palaeodiscus* the pores are closer to the perradial suture than in *Cavanechinus*.



Cavanechinus warreni gen. n. et sp. n. A. Sketch of Holotype (Aust. Mus. No. F. 52154), showing apical portion of interambulacrum and ambulacrum. Compare with Plate IV, fig. 1. B. Enlargement of ambulacral plates showing position of the pore-pairs. *cf.* Plate IV, fig. 2.

Porechinus Dehm, 1961, from the Rhine Valley, Germany, the only known early Devonian member of the Lepidocentridae, is based on a poorly preserved specimen, but differs from *Cavanechinus* in that the inner pore (nearer the perradial suture) is not completely enclosed by the ambulacral plate.

Lepidocentrus mülleri Schultze from the Middle Devonian of Germany as figured by Jackson (1912) Pl. 20, fig. 8, has a much larger test, but the shape, arrangement and ornamentation of the interambulacral plates are similar to those of *Cavanechinus* ; however, there are nearly twice the number of ambulacral plates to the height of one adradial plate.

Lepidechinoides Olsson, 1912, from the Middle Devonian of North America, most closely resembles *Cavanechinus* in so far as comparable characters are revealed. The genus was revised by Cooper (1931). It differs from *Cavanechinus* in that the ambulacra are relatively wider, being one-third to one-half the width of an interambulacrum, and the ambulacral plates are relatively larger, the height of two to four ambulacral plates equalling the height of one adradial plate.

Albertechinus Stearn, 1956, from the Upper Devonian of the Canadian Rockies, northwest of Calgary, Alberta, differs from *Cavanechinus* in that the interambulacra consist of numerous large and small irregularly arranged plates.

The only other known well-preserved specimen of an echinocystitoid from the Devonian is *Rhenechinus* Dehm, 1953, from the Lower Devonian Hansrückschiefer of Germany. It differs from *Cavanechinus* fundamentally in having four columns of plates in each ambulacrum, the occluded plates alternating with the primaries. There are seven or eight rows of plates in the interambulacra.

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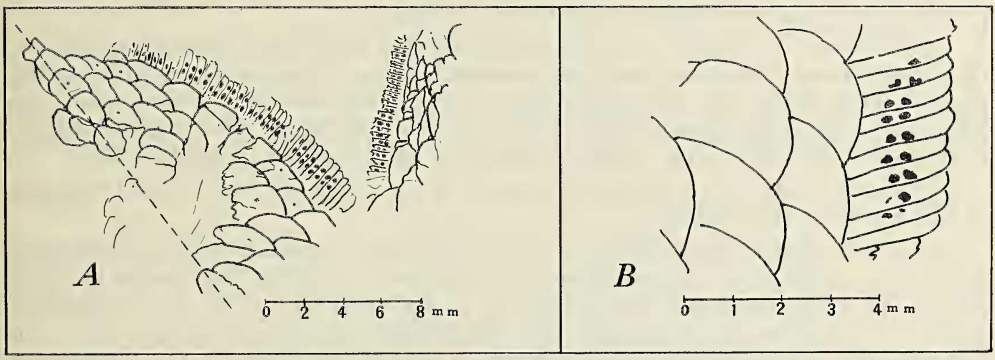

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Cavanechinus warreni, sp. n.

Plate IV, Figs. 1 and 2; Text-fig.

Diagnosis—As for the genus.

Type Specimen—Holotype, Australian Museum, Sydney, No. F. 52154.

Material—The echinoid remains consist of numerous fragments embedded in a block of limestone about 10 cm. by 8·5 cm. by 2·5 cm. The largest specimen is that illustrated in Plate IV, fig. 1 (chosen as the holotype) covering an area of approximately 20 mm. by 20 mm. It consists of the adapical portions of two interambulacral areas and the intervening ambulacrum. The limestone block also shows several patches of imbricating ambulacral and interambulacral plates as illustrated in Plate IV, fig. 5, as well as scores of isolated plates, small spines (Plate IV, figs. 3 and 4) and possibly fragments of Aristotle's Lantern.

Shape—The holotype has been flattened but the curvature of the median suture of the ambulacrum indicates that the test must have been approximately globular, with an estimated diameter of 30 mm.

Ambulacra—The specimen shows two columns of primary ambulacral plates, which have been separated along the perradial suture. The plates are imbricating adorally and under the interambulacra. All the exposed plates are about the same size, each being about 2 mm. wide and 0·4 mm. high. The exposed height of four or five ambulacral plates equals the height of one adradial plate.

The ambulacrum is almost one quarter of the width of the interambulacrum at the widest part exposed.

The pore-pairs are uniserial; each pore-pair is situated approximately in the centre of the plate and each pore is completely enclosed by the ambulacral plate. No tubercles have been observed; the specimen is on the weathered surface of the limestone and any fine ornamentation may have been lost: in fact the edge of the ambulacrum figured at the left of Plate IV, fig. 1 has been partly eroded.

Interambulacra—These consist of at least nine columns of plates. The holotype shows portion of the central row and four lateral rows of plates on one side and a few plates on the other side. At its widest part it is nearly four times the width of the ambulacrum. The plates are strongly imbricating adapically and laterally away from the central column over the ambulacral plates. On account of weathering no fine ornamentation is preserved and the exposed edges of the plates appear rounded. Some of the plates show a low tubercle near the centre, others show a perforation in the same position.

The reverse side of the specimen shows many isolated plates, both ambulacral and interambulacral, the latter frequently hexagonal in outline (Plate IV, figs 3, 4), with a central perforation.

Spines—No spines have been seen attached to the plates of the holotype, but numerous hollow, simple spines are associated with the plates on the reverse side of the specimen (Plate IV, figs. 3,4).

Lantern, *apical* and *adoral systems* are not known. A few isolated fragments show some resemblance to portions of echinoid teeth.

Occurrence—Cavan Bluff Limestone, Murrumbidgee Series. Middle Devonian.

Locality—On the north side of Burrenjuck Reservoir, within a quarter of a mile to the west of the northern end of Taemas Bridge over the Murrumbidgee River, 13 miles south of Yass, N.S.W. Collected by Dr. J. Warren.

References

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EXPLANATION OF PLATE IV

Figs 1–5

Cavanechinus warreni Brown, gen. n. et sp. n. from Cavan Bluff Limestone, Murrumbidgee Series; near Taemas Bridge, 13 miles south of Yass, N.S.W. Middle Devonian. *Photo. I.A.B.*

Fig. 1

Adapical view of holotype (Aust. Mus., No. F. 52154) showing apical portion of ambulacrum and adjacent interambulacrum. Mag. ×4.

Fig. 2

Adapical view of portion of ambulacrum and adjacent interambulacrum showing imbrication and position of the pore-pairs. Mag. ×10.

Fig. 3

Isolated plates and spines. Mag. ×10.

Fig. 4

Isolated hexagonal plates and spines. Mag. ×4.

Fig. 5

Patches of imbricating plates—interambulacral on the left, and side view of ambulacral plates in the upper centre. Mag. ×4.

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